Discussion Papers In Economics And Business

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Discussion Paper 20-18

January 2021

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Does It Matter Where You Invest?
The Impact of FDI on Domestic Job Creation and Destruction*

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Abstract

This study uses unique division-level data of Japanese firms to examine how foreign direct investment (FDI) affects domestic employment. Contrary to most previous studies focusing on the effect on net employment growth, we decompose it into gross job creation and gross job destruction. We find that FDI destination plays an important role: FDI to Asia increases job creation, while FDI to Europe or North America decreases it. A frictional search-and-matching model with heterogeneous jobs can explain the differential effects. The model provides additional predictions on job creation and destruction by job type, which are also empirically confirmed.

JEL classification numbers: F23; J21; J23

Keywords: Outward FDI, firm-establishment-division-level data, multinational enterprises (MNEs), large-firm search model, high/low-skilled jobs

* This study was conducted as a part of project undertaken at the Research Institute of Economy, Trade and Industry (RIETI). The current revised version is conducted as a part of project supported by JSPS KAKENHI (Grant Number JP18K12777, JP19K13693, JP99K13693). It utilises the data based on the "Basic Survey of Japanese Business Structure and Activities" (BSJBSA) which is conducted by the Ministry of Economy, Trade and Industry (METI). We are very grateful to seminar and conference participants at JEA 2019 Spring Meeting, European Trade Study Group 2019, Sophia University, Kyoto University, KER Conference 2020, and JSIE Workshop.

I. Introduction

Along with the rapid globalization since the late nineties, multinational firms have increased their influence on the domestic labor market. In the period between 1990 and 2015, world foreign direct investment (FDI) flows increased 9.4-fold or 2.8 times faster than world gross domestic product (GDP) and 1.9 times faster than world trade.[1] This trend evoked a skeptic view in developed countries that domestic jobs would be offshored to low-wage developing countries. Whether outward FDI contributes to home employment has drawn much academic and policy interest. The empirical literature thus far has provided mixed evidence, depending on the sample countries and performance measures of foreign activities. Due to data limitations, most of the studies focus on the effect of FDI on net employment growth, which is the difference between gross job creation (total employment gains in expanding establishments) and gross job destruction (total employment losses in contracting establishments).

Even on finding a positive effect of FDI on net employment growth, one should be cautious in concluding that FDI is always good for home employment. Net employment growth can be positive in both cases: (i) where gross job creation increases and gross job destruction is unchanged and (ii) where job creation is unchanged and gross job destruction decreases. The two cases illustrate very different labor markets: case (i) shows an active labor market favoring job seekers, while case (ii) shows a stable one rewarding existing employees. For a country benefitting from globalization, case (i) would be more preferable than case (ii), because welfare gains are obtained through the reallocation of factors between sectors and firms to their most productive uses (Melitz, 2003; Autor, Dorn and Hanson, 2013; Dix-Carneiro and Kovak, 2017).

This study examines the impact of outward FDI on job creation and job destruction using unique Japanese firm-establishment-division level panel data from 1996 to 2016. Contrary to most existing studies, we construct a measure of job creation and destruction within

[1] The data are from the World Bank Development Indicators: https://databank.worldbank.org/home.aspx.

an establishment by exploiting information on division level employment. Specifically, we count the number of newly added jobs for all divisions within a firm with multiple establishments and use it to define the job creation of the firm. Similarly, we define the job destruction of a firm as the number of newly eliminated jobs for all divisions within the firm. This definition helps interpret our empirical results by elucidating firm-decision-making based on which we build a frictional search-and-matching model with heterogeneous jobs. The theory highlights the roles of different jobs (or divisions), and its mechanism is further confirmed empirically.

We also pay special attention to the destinations of FDI, which are strongly associated with the purpose of the FDI. Multinationals tend to invest in developing countries in Asia to seek low-price factors, which is known as vertical FDI. Contrastingly, those investing in Europe and/or North America tend to be motivated by gaining better access to the local market, known as horizontal FDI.[2] Apart from the availability of unique data, the case of Japan is particularly worth investigating because the destination of Japanese FDI is geographically dispersed. Japan's FDI into Europe and North America and Asia accounted for 65% and 25% in 2015, respectively, both concerning the value of outward FDI and the number of affiliates.[3] In this way, Japanese FDI provides an ideal example to compare the various impacts of vertical and horizontal FDI on the labor market of developed countries.

We specifically examine the effect of FDI into Asia and Europe/North America, measured by the log number of foreign affiliates, on their domestic job creation and destruction. Our identification strategy uses industry-mean FDI as an instrument for firm-level FDI.[4] There

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[2] See Markusen (2004, Ch. 8) on theoretical accounts for vertical and horizontal FDI.

[3] The data on FDI values are from JETRO (in Japanese): https://www.jetro.go.jp/world/japan/stats/fdi.html. The data on the number of affiliates, which corresponds to "Number of enterprises," are from OECD Statistics: https://stats.oecd.org.

[4] Our strategy is partly inspired by studies on intergenerational persistence of economic status (Shea, 2000) and money and happiness (Luttmer, 2005; Pischke, 2011; Li et al., 2014). For example, to see whether higher

are two reasons why we believe this is a plausible instrument. First, industry-mean FDI is an aggregate measure that is correlated with FDI by individual firms but is beyond individual influences. Second, part of the variation in industry-mean FDI is attributed to industry characteristics rather than firm characteristics. For example, some industries such as chemical and machinery are by nature easier to fragment their production processes into finer stages and offshore processes than other industries (Hummels et al., 2001 suggestive evidence). Another example to indicate industry-specific attributes is that factor costs within and across countries differ widely by industry (Du Caju et al., 2010). Du Caju et al. (2010) conclude that interindustry wage differentials in eight European countries could reflect the difference in labor market institutions. We further address potential concerns about the self-selection of firms into particular industries by controlling for measures of firm characteristics such as revenue, productivity, research and development (R&D), and capital-labor ratio.

The results indicate that investments in Asia and Europe/North America have a positive effect on net employment growth in Japan. The effect on gross employment changes, that is, job creation and destruction, may differ by destination. Investment in Asia has a positive effect on domestic job creation, whereas investment in European/North American countries has a negative effect. Regarding job destruction, the impact is negative regardless of the FDI destination.

We then construct Wasmer's (1999) based frictional job-search-and-matching model to illustrate the mechanism by which FDI can affect domestic job creation and destruction differently in different destinations.[5] In the model, there are two types of jobs: high-skilled and

income raises happiness, Pischke (2011) and Li et al. (2014) use industry-average wage as an instrument for family/individual income. In this context, Pischke and Schwandt (2012) give a cautionary note on the industry-level instrument. Applications in the context of international trade can be found in, e.g., Hoekstra (2013).

[5] While the flow of jobs created must be equal to that of jobs destroyed in the steady state where all adjustments are done, these may differ in the short run where state variables such as capital and (un)employment rate do not change.

low-skilled. Firms face a trade-off between paying high search costs and enjoying a stable match with high-skilled workers, or paying low search costs but having an unstable match with low-skilled workers. An exogenous increase in the FDI of a firm requires more support from home, thereby making the match of both job types more stable. This setting is motivated by the fact that outward FDI by Japanese multinationals in automobile industry is complementary to exports of intermediate parts from Japan (Nishitateno, 2013). It can explain the empirical result of why FDI, regardless of its destination, accounts for lower job destruction.

The effect of FDI in different regions on the duration of domestic job match is assumed to vary, given the fact that the purpose of FDI by Japanese multinationals differs regionally. Japanese multinationals investing in Asia tend to export intermediate goods from home to affiliates for low-cost assembly (Fukao et al., 2003; Fujita and Hamaguchi, 2012).[6] Thus, FDI to Asia is thought to be complementary to low-skilled domestic workers engaged in production and related services, creating more low-skilled jobs and fewer high-skilled jobs. Due to its low hiring cost, the increase in low-skilled job creation raises the overall job creation despite the decline in high-skilled job creation.

Contrastingly, Japanese multinationals investing in Europe/North America tend to substitute exports from home for local production and services to save transportation costs. FDI to Europe/North America is thought to be substitutable to domestic low-skilled workers, making firms create fewer low-skilled jobs and more high-skilled jobs. Because of the high hiring cost, the magnitude of increase in high-skilled job creation is not as high as that of the decrease in low-skilled jobs. Thus, overall job creation declines. We further test this theoretical mechanism by dividing divisions into high-skilled and low-skilled ones and measuring job creation and

[6] According to Nishitateno (2013), outward FDI in automobile industry shows a stronger complementarity to exports from Japan to Asia than exports from Japan to other regions. Fukao et al. (2003) find that trade in similar but quality-differentiated products (i.e., vertical intra-industry trade), which is likely to be driven by factor-cost differences, are more prominent in Asia than in Europe.

destruction of each division.

Relation to the literature

There is a wide body of literature on the impact of outward FDI on the home labor market using firm/establishment-level data. Existing studies find mixed evidence (Brainard and Riker, 1997; Desai et al., 2009; Muendler and Becker, 2010; Kovak et al., 2018).[7] Using data on United States (US) multinationals, Desai et al. (2009) and Kovak et al. (2018) find a positive effect of affiliate employment on parent employment. Contrastingly, Muendler and Becker (2010) use data on German multinationals to estimate the labor demand system and find negative elasticities of home employment with respect to foreign wage.

These mixed findings have motivated subsequent studies to take a deeper look at the destinations of FDI (Debaere et al., 2010; Navaretti et al., 2010; Harrison and McMillan, 2011; Hijzen et al., 2011). By dividing the destinations of US multinationals into high- and low-income countries, Harrison and McMillan (2011) find that affiliate employees in low-come countries are substitutable for parent employees in the US. Debaere et al. (2010) echo their results using data on South Korean multinationals: starting operation in less-advanced countries decreases parent employment growth. Hijzen et al. (2011) contrastingly find that FDI in low-income (or high-income) countries has no significant (or positive) effect for French multinationals. These studies measure the labor variation by applying the level or growth rate of employment of parent firms.

We take one step further, and decompose net employment growth into gross job creation and destruction by utilizing unique firm-establishment-division level data. We follow

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[7] See Hummels et al. (2018) for comprehensive surveys. There is another growing literature on the impact of import competition on domestic labor market, starting from Autor et al. (2013). Subsequent studies focus on the role of service sector (Feentsra and Sasahara, 2018), export exposure (Feenstra et al., 2019), worker heterogeneity (Endoh, 2017), global value chains (Choi and Xu, 2019), and intermediate inputs (Taniguchi, 2019).

the approach of Davis and Haltiwanger (1999) to calculate job creation and job destruction. Our approach differs from theirs in that the calculations of job creation/destruction are conducted at the division level rather than at the establishment level, which allows us to take advantage of the detailed information on labor variation for each division within firms. Job creation and destruction constructed from division-level data also motivated us to build a simple frictional search-and-matching theory with heterogeneous jobs, whose implications are further verified by additional empirical tests. There are a few exceptional studies examining the relationship between job creation and destruction of parent firms and establishments (Moser et al., 2010; Boehm et al., 2020). However, their focus is not on the differential impact of FDI on different destinations, which is of primary interest.

When it comes to the studies using data on Japanese multinationals, Hijzen et al. (2007) and Yamashita and Fukao (2010) find that outward FDI has a positive effect on net employment growth and firm performance.[8] The closest study to ours is Hayakawa et al. (2013), examining the role of FDI destinations.[9] More specifically, they find that starting operations both in low-income countries (vertical FDI) and high-income countries (horizontal FDI) has a positive effect on net employment. We echo their findings in that an increase in the number of affiliates in both Asia (vertical FDI) and Europe/North America (horizontal FDI) has a positive effect on net employment growth. We further advance their findings by taking a closer look at gross job flows, which can be decomposed into job creation and destruction. Although there are a few studies measuring job creation and destruction using data on Japanese multinationals (Ando and Kimura, 2015; Kodama and Inui, 2015), they focused on aggregated job flows such as industry-level or sector-level job creation and destruction based on firm-establishment level

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8 Other studies examining the impact of FDI by Japanese multinationals on domestic labor market focus on the entry and exit of establishments (Ito and Ikeuchi, 2017) and non-regular workers (Tanaka, 2017).

9 Kambayashi and Kiyota (2015) also highlight the role of FDI destinations. However, their main focus is on the prices of final and investment goods in destination countries, rather than the direct impact of FDI.

data rather than firm-establishment-division level data. Furthermore, econometric analysis of job creation and destruction were not provided in those studies.

Apart from empirical practice, our simple theory to explain the differential effects of FDI on job creation and destruction also contributes to the theoretical literature on the large-firm version of the frictional search-and-matching model (Pissarides, 2000, Ch. 3; Wasmer, 1999; Cahuc and Wasmer, 2001).[10] Contrary to the standard matching model, where there is a one-to-one match between workers and jobs/firms, the large-firm setting allows one firm to match with multiple workers and is, thus, more suitable for interpreting reduced-form empirical results than the standard setting. Wasmer (1999) extends it to incorporate two types of heterogeneous jobs: one with high hiring cost and low job-separation rate, and the other with low hiring cost and high job-separation rate. He examines the effect of the growth of labor productivity on job composition in a steady state. We simplify his framework and conduct different comparative statics: how changes in job-separation rate, which is assumed to be caused by FDI, affect job creation and destruction of each type of job in the short run, where state variables remain unchanged. Although our framework is similar to that of Wasmer (1999), the full analytical characterization of comparative statics reveals the exact relationship between the aggregate job creation and the job creation of each job type. We believe the results obtained in this study would be a useful benchmark when sorting out the empirical results of FDI's impact on domestic job creation and destruction.

The remainder of this study is organized as follows. The next section introduces the data and estimation strategy. Section 3 presents the empirical results. To propose a possible mechanism behind the results, Section 4 builds a frictional search-and-matching model. The model provides additional testable implications, which are empirically confirmed. The final

[10] Subsequent studies using the large-firm setting (multi-worker firm setting in general) examine the generalization of intra-firm bargaining (Cahuc et al., 2008; Acemoglu and Hawkins, 2014), business cycle (Mandelman and Zanetti, 2014; Dossche et al, 2019; Kudoh et al., 2019), and many other issues.

section concludes the study.

II. Data and methodology

Data, job creation, and job destruction

This study uses firm-level data collected through the Basic Survey of Japanese Business Structure and Activities (BSJBSA), which is conducted annually by the Ministry of Economy, Trade, and Industry, Japan. The survey covers almost all medium and large firms in Japan; small firms who employ ≥ 50 workers with ≥ 30,000,000 yen worth of capital are also included. The response rate is over 80%, with around 30,000 firms completing the questionnaire each year. The samples of manufacturing and non-manufacturing firms were used for this study, covering the years 1995–2017. Summary statistics of the data are reported in Table A1 of Appendix 1. We removed outliers that recorded negative value terms such as R&D, revenue, or export.

The approach for calculating job creation and destruction is similar to that used by Davis and Haltiwanger (1999); the difference is that our calculations occur at the division level and, thus, capture the job creation and destruction within the firm. Job creation in a firm is defined as the sum of all new jobs in the firm's expanding and newly opened divisions, while job destruction in a firm is defined as the sum of all eliminated jobs in the firm's downsizing or closed divisions. Furthermore, the firm's branches or plants are considered to be similar to divisions. Newly set up and closed firms are excluded; they are not within the scope of this study's objectives because such job creation/destruction instances are quite different from those in existing firms.

First, the magnitude of job creation in firm i in year t is defined as the sum of all new jobs in expanding divisions in firm i in year t, represented as follows (the number of divisions in firm i is d):

$$JC_{i,t} = \sum_{d=1}^{S} \Delta N_{i,d,t}^{C}$$

where

$$\Delta N_{i,d,t}^{C} = N_{i,d,t} - N_{i,d,t-1}$$

conditioned on

$$N_{i,d,t} - N_{i,d,t-1} > 0.$$

In the above equations, *S* is the number of divisions in firm *i*, and $N_{i,d,t}$ is the number of workers employed in division *d* in firm *i* in year *t*.

The magnitude of job destruction in firm *i* in year *t* is defined as the sum of all diminished jobs in diminishing divisions in firm *i* in year *t*, represented as follows (the number of divisions in firm *i* is *d*):

$$JD_{i,t} = \sum_{d=1}^{S} \Delta N_{i,d,t}^{D}$$

where

$$\Delta N_{i,d,t}^{D} = -(N_{i,d,t} - N_{i,d,t-1})$$

conditioned on

$$N_{i,d,t} - N_{i,d,t-1} < 0.$$

In practice, we use JC and JD as our main dependent variables. Furthermore, to make the analysis comparable to the previous literature, we also calculate the within-firm net employment and investigate how the Japanese multinational firms' overseas investments will affect these measurements.

Estimation strategy

Our baseline regression of job creation takes the following form:

$$JC_{it} = \gamma_1 Asia\_affiliate_{it} + \gamma_2 EU\_NA\_affiliae_{it} + \gamma_3 Controls_{it} + \gamma_i + \gamma_t + e_{it} \quad (1)$$

$$JC_{it} = \delta_1 Asia\_affiliate_{it} + \delta_2 EU\_NA\_affiliate_{it} + \delta_3 Controls_{it} + \delta_i + \delta_t + \varepsilon_{it} \quad (2)$$

The regressions for job destruction and net employment, that is, job creation minus job destruction, are analogously defined. $Asia\_affiliate$ is the log of the number of Asian affiliates of firm *i* in year *t*, and $EU\_NA\_affiliate$ is the log of the combined number of affiliates that are located in Europe or North America for firm *i* in year *t*. *Controls* is the vector of control variables including the capital-labor ratio, R&D expenditure share concerning revenue, foreign capital share, firm age, revenue (log), and total factor productivity.[11] Firm and year fixed effects are also included.

Because both FDI decisions and domestic employment decisions are made by the same firm, our estimation may be subject to endogeneity bias. One might consider that firms actively engaged in foreign investment need to make adjustments to within-firm employment more frequently because these firms are more sensitive to cost variation and labor reallocation is an efficient way to alleviate cost shocks. If this is the case, our baseline estimation may suffer from self-selection biases. To mitigate this problem, we apply a two-stage instrumental variable (IV) method. An ideal instrument is the one that is closely related to firms' FDI decision but does not affect the employment dynamics within firms. Thus, the instrument we can think of naturally is the industry-level FDI trend. In practice, we use the (log) average number of Asian affiliates and European/North American affiliates in industry *j* in year *t*, and

[11] In the baseline specification, we use the method as in Levinsohn and Petrin (2003). For robustness checks, we apply Olley and Pakes (1996), and stochastic frontier methods as well.

$mean\_Asia\_affiliate_{jt}$ and $mean\_EU\_NA\_affiliate_{jt}$ as an instrument for $Asia\_affiliate_{it}$ and $EU\_NA\_affiliate_{it}$, respectively. The fitted value obtained in the first stage will be used in the second stage to measure the elasticity of within-firm employment regarding FDI.

The industry-mean FDI is correlated with but is not directly affected by individual firm FDI as long as the industry is sufficiently large. Besides, at least part of the variation in industry-mean FDI comes from industry characteristics rather than from firm characteristics; thus, the instrument is plausibly exogenous to firm-decision making on domestic employment. There are two arguments why we think this is the case. First, how easily firms expand foreign activities crucially depends on the nature of the products and services of their industry. Some industries are more amenable to the spatial separation of production processes and, thus, tend to establish more foreign affiliates than other industries (Baldwin, 2016). Suggestive evidence for the industry variation of the easiness of the so-called unbundling reported that the use of imported intermediates in producing goods exported, which they call vertical specialization, varies widely across industries within a country in 10 Organisation for Economic Co-operation and Development (OECD) countries and four emerging economies (Hummels et al., 2001; Johnson and Noguera, 2012).[12] Second, inter-industry factor costs, particularly wages, vary widely across countries, mainly due to differences in institutions (Du Caju et al., 2008; 2010). Du Caju et al. (2010) observed huge inter-industry wage differential across eight member countries in the European Union (EU) and attributed this to the difference in rent-sharing rule determined by countries' labor market institutions.

[12] A concept related to vertical specialization is vertical intra-industry trade (Fontagne and Freudenberg, 2002 for a survey).

III. Estimation results

Table 1 demonstrates the baseline estimation results, as in Eqs. (1) and (2): This shows that FDI to Asian countries has a positive effect on domestic job creation, but the effect is negative for FDI to European/North American countries. As indicated in columns (3) and (4), FDI to Asian countries prevents firms from removing the jobs, and so does the investment in Europe/North American countries. When we combine these two effects, as presented in columns (5) and (6), FDI to Asia has an overall positive impact on the net employment of Japanese firms, which is easy to follow because the job creation effect is much larger. In the meantime, FDI to Europe/North America is also associated with net employment growth. If we compare the magnitude of the coefficient of *EU_NA_affiliate* between the case of JC and JD, it can be concluded that the decrease in JD surpasses that in JC, which leads to positive net employment growth.

TABLE 1
Baseline results

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	JC	JC	JD	JD	Net	Net
Asia_affiliate	20.68***	17.24***	-1.204	-1.256	29.27***	25.80***
	(3.627)	(3.633)	(3.712)	(3.719)	(3.653)	(3.662)
EU_NA_affiliate	-8.457*	-10.44**	-41.34***	-41.55***	50.14***	48.46***
	(4.568)	(4.570)	(4.674)	(4.678)	(4.532)	(4.536)
Capital_labor_ratio	-50.71***	-46.48***	9.713***	11.59***	-68.94***	-66.80***
	(2.809)	(2.856)	(2.874)	(2.924)	(2.903)	(2.954)
R&D share	-8.842	6.761	9.776	7.041	-22.95	1.454
	(18.72)	(18.69)	(19.16)	(19.13)	(20.58)	(20.55)
Foreign_capital_share	-0.0899***	-0.0904***	-0.0976***	-0.0985***	-0.0439*	-0.0413
	(0.0212)	(0.0212)	(0.0217)	(0.0217)	(0.0257)	(0.0257)
Firm_age	-0.00673	-0.00665	-0.00309	-0.00321	-0.00333	-0.00277
	(0.0151)	(0.0151)	(0.0154)	(0.0154)	(0.0223)	(0.0223)
TFP_LP	-2.843		25.15***		-37.98***	
	(4.431)		(4.534)		(4.566)	

ln_Revenue		29.94***		19.25***		5.855
		(3.905)		(3.997)		(4.036)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	151,727	151,727	151,727	151,727	128,763	128,763
R-squared	0.007	0.007	0.006	0.006	0.009	0.009
Number of firms	23,368	23,368	23,368	23,368	20,579	20,579

Standard errors are in parentheses. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.

Notes: "Net" in columns (5) and (6) is defined as the difference between JC and JD.

As for the instrumental variable estimation, to test the credibility of the instruments, we calculated the correlation between IVs and major variables of interest. As can be seen from Table 2, *mean_Asia_affiliate* and *mean_EU_NA_affiliate* have almost no correlation with the dependent variables, whereas the correlation with the instrumented variables is relatively high.

The first-stage results are presented in Table 3-A. *mean_Asia_affiliate* is shown to positively affect *Asia_affiliate* and *EU_NA_affiliate*, but the same does not apply to *mean_EU_NA_affiliate*. When it comes to the second-stage estimation, as indicated in Table 3-B, *Asia_affiliate* has a positive effect on job creation, and the effect is negative for *EU_NA_affiliate*. As indicated in columns (3) and (4), both the investment in Asian and European/North American countries negatively affects JD. If we combine these two effects (impact on JC and JD) because the magnitude of JC is larger than that on JD, for both *Asia_affiliate* and *EU_NA_affiliate*, we should expect their impact on the net employment to follow the trend of JC. The results in columns (5) and (6) verify our predictions.

TABLE 2

Correlation between the IVs and variables of interest

	JC	JD	Net

mean_Asia_affiliate	-0.0107	-0.0093	-0.0026
mean_EU_NA_affiliate	-0.0032	0.001	-0.0048

	Asia_affiliate	EU_NA_affiliate
mean_Asia_affiliate	0.2441	0.1591
mean_EU_NA_affiliate	0.2202	0.1666

TABLE 3-A

IV estimation: First stage results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	JC/JD				Net			
Dependent variable	Asia_affiliate	EU_NA_affiliate	Asia_affiliate	EU_NA_affiliate	Asia_affiliate	EU_NA_affiliate	Asia_affiliate	EU_NA_affiliate
mean_Asia_affiliate	0.0734***	0.0181***	0.0709***	0.0163***	0.0680***	0.0171***	0.0651***	0.0152***
	(24.96)	(7.72)	(24.17)	(7.00)	(21.58)	(6.72)	(20.70)	(5.97)
mean_EU_NA_affiliate	-0.0324***	0.0127***	-0.0306***	0.0139***	-0.0309***	0.0141***	-0.0287***	0.0155***
	(-10.52)	(-5.16)	(-9.97)	(-5.67)	(-9.44)	(-5.34)	(-8.81)	(-5.9)
Capital_labor_ratio	0.0333***	0.0207***	0.0501***	0.0303***	0.0303***	0.0190***	0.0470***	0.0286***
	(14.49)	(11.31)	(21.55)	(16.34)	(11.79)	(9.19)	(18.07)	(13.60)
R&D share	0.135***	0.0895***	0.139***	0.0944***	0.158***	0.123***	0.164***	0.129***
	(8.80)	(7.35)	(9.12)	(7.78)	(8.70)	(8.38)	(9.04)	(8.82)
Foreign_capital_share	-0.000191***	-0.000115***	-0.000196***	-0.000117***	-0.000113***	-0.000132***	-0.000116***	-0.000133***
	(-11.01)	(-8.33)	(-11.34)	(-8.54)	(-4.98)	(-7.18)	(-5.12)	(-7.26)
Firm_age	0.0000229	0.0000151	0.0000221	0.0000147	0.0000523**	0.0000331*	0.0000526**	0.0000334*
	(1.85)	(1.54)	(1.79)	(1.50)	(2.65)	(2.08)	(2.68)	(2.10)
TFP_LP	0.148***	0.0777***			0.145***	0.0760***		
	(40.99)	(27.10)			(36.01)	(23.46)		
ln_Revenue			0.157***	0.0881***			0.157***	0.0880***
			(49.66)	(35.07)			(44.46)	(30.88)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	147152	147152	147152	147152	124758	124758	124758	124758

t statistics are in parentheses. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.

TABLE 3-B

IV estimation: Second stage results

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	JC	JC	JD	JD	Net	Net
Asia_affiliate	185.5**	144.1**	-9.466	-14.01	197.1***	154.1**
	(73.31)	(72.90)	(74.02)	(74.03)	(73.67)	(74.04)
EU_NA_affiliate	-339.2***	-301.6**	-241.5*	-239.3*	-71.84	-32.92
	(130.0)	(128.2)	(131.3)	(130.2)	(117.7)	(116.4)
Capital_labor_ratio	-49.02***	-43.71***	14.52***	18.66***	-71.70***	-70.59***
	(3.305)	(3.776)	(3.337)	(3.834)	(3.302)	(3.777)
R&D share	-1.332	16.93	30.04	28.73	-35.23	-9.651
	(20.34)	(20.37)	(20.54)	(20.69)	(22.66)	(22.77)
Foreign_capital_share	-0.0964***	-0.0998***	-0.123***	-0.125***	-0.0403	-0.0366
	(0.0233)	(0.0233)	(0.0235)	(0.0237)	(0.0280)	(0.0279)
Firm_age	-0.00544	-0.00511	0.000261	9.79e-05	-0.00832	-0.00701
	(0.0155)	(0.0154)	(0.0156)	(0.0156)	(0.0227)	(0.0226)
TFP_LP	-1.948		42.37***		-53.81***	
	(7.816)		(7.891)		(8.075)	
ln_Revenue		35.48***		39.12***		-7.736
		(8.079)		(8.204)		(8.465)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	147,152	147,152	147,152	147,152	124,758	124,758
Number of firms	18,793	18,793	18,793	18,793	16,574	16,574
Cragg-Donald Wald F statistic	76.68	78.00	76.68	78.00	73.57	74.38

Standard errors are in parentheses. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.

Notes: We use *mean_Asia_affiliate* and *mean_EU_NA_affiliate* as IVs.

Robustness checks and further issues

For robustness checks, we use alternative instruments—exchange rate and lagged values of *Asia_affiliate* and *EU_NA_affiliate* (Alfaro et al., 2004; Keller and Yeaple, 2009). From theoretical and empirical standpoints, exchange rates are known as one of the significant determinants of FDI (Froot and Stein, 1991; Blonigen, 1997).[13] Among others, Froot and Stein (1991) emphasize that real exchange rates affect the attitudes of foreign investors by changing their relative wealth. A depreciation in the real exchange rate of the host country makes assets relatively cheap. Thus, foreign multinationals invest more in the host country under imperfect capital markets, where external financing is more costly than internal financing. The validity of our instruments rests on such theories. Similar identification strategies can be found in Alfaro et al. (2004), who examine the effect of FDI on economic growth, and in Keller and Yeaple (2009), who examine the effect of FDI on firm productivity. We will follow these practices and use real effective exchange rates of the Japanese Yen against Asian and European/North American regions as verification instruments.[14] The results are presented in Table 4. Generally, the impact of *Asia_affiliate* and *EU_NA_affiliate* on JC and JD has the same signs as in the previous results and is statistically significant. Both have a positive influence on net employment, which is also consistent with previous findings.

TABLE 4-A

First stage results using alternative IVs (exchange rates and lagged FDI measurements)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	JC/JD				Net			
Dependent variable	Asia_affiliate	EU_NA_affiliate	Asia_affiliate	EU_NA_affiliate	Asia_affiliate	EU_NA_affiliate	Asia_affiliate	EU_NA_affiliate
RER_EU/NA	0.000589	0.00023	0.000532	0.000208	0.000589	0.00023	0.000532	0.000208

[13] See also Görg and Wakelin (2002); and Qi et al. (2019) for subsequent developments.

[14] See Appendix 2 for how we construct the real effective exchange rates by region.

	(0.88)	(0.40)	(0.80)	(0.36)	(0.88)	(0.40)	(0.80)	(0.36)
Lag_Asia_affiliate	0.741***	0.0357***	0.740***	0.0348***	0.741***	0.0357***	0.740***	0.0348***
	(345.90)	(19.46)	(344.84)	(18.95)	(345.90)	(19.46)	(344.84)	(18.95)
Lag_EU_NA_affiliate	0.0343***	0.710***	0.0331***	0.709***	0.0343***	0.710***	0.0331***	0.709***
	(12.85)	(310.57)	(12.38)	(310.16)	(12.85)	(310.57)	(12.38)	(310.16)
Capital_labor_ratio	0.00422*	0.00298*	0.00969***	0.00574***	0.00422*	0.00298*	0.00969***	0.00574***
	(2.42)	(2.00)	(5.47)	(3.78)	(2.42)	(2.00)	(5.47)	(3.78)
R&D share	0.0498***	0.0405***	0.0524***	0.0426***	0.0498***	0.0405***	0.0524***	0.0426***
	(4.02)	(3.82)	(4.23)	(4.03)	(4.02)	(3.82)	(4.23)	(4.03)
Foreign_capital_share	0.0000511**	0.0000148	0.0000497**	0.0000142	0.0000511**	0.0000148	0.0000497**	0.0000142
	(3.27)	(1.11)	(3.18)	(1.07)	(3.27)	(1.11)	(3.18)	(1.07)
Firm_age	0.0000223	0.0000287	0.0000225	0.0000296	0.0000223	0.0000287	0.0000225	0.0000296
	(1.67)	(0.25)	(1.68)	(0.26)	(1.67)	(0.25)	(1.68)	(0.26)
TFP_LP	0.0451***	0.0206***			0.0451***	0.0206***		
	(16.45)	(8.80)			(16.45)	(8.80)		
ln_Revenue			0.0501***	0.0247***			0.0501***	0.0247***
			(20.68)	(11.93)			(20.68)	(11.93)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	118859	118859	118859	118859	118859	118859	118859	118859

t statistics are in parentheses. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.

TABLE 4-B

Second stage results using alternative IVs (exchange rates and lagged FDI measurements)

Dependent variable	(1) JC	(2) JC	(3) JD	(4) JD	(5) Net	(6) Net
Asia_affiliate	16.44***	11.98**	-13.25**	-13.40**	26.58***	22.09***
	(5.903)	(5.919)	(6.080)	(6.098)	(5.171)	(5.187)
EU_NA_affiliate	-33.64***	-36.28***	-43.24***	-43.56***	6.981	4.542
	(7.609)	(7.616)	(7.838)	(7.845)	(6.666)	(6.674)
Capital_labor_ratio	-63.69***	-59.32***	5.587	7.449**	-69.94***	-67.17***
	(3.469)	(3.532)	(3.573)	(3.639)	(3.039)	(3.096)
R&D share	-17.82	4.052	5.886	2.965	-18.40	7.094
	(24.68)	(24.64)	(25.43)	(25.38)	(21.62)	(21.59)
Foreign_capital_share	-0.0507	-0.0490	-0.0128	-0.0138	-0.0473*	-0.0446
	(0.0311)	(0.0311)	(0.0320)	(0.0320)	(0.0272)	(0.0272)
Firm_age	0.0313	0.0317	0.0357	0.0358	-0.00146	-0.00104
	(0.0266)	(0.0266)	(0.0274)	(0.0274)	(0.0233)	(0.0233)
TFP_LP	-11.59**		24.49***		-35.38***	
	(5.490)		(5.655)		(4.809)	
ln_Revenue		27.94***		19.33***		10.58**
		(4.868)		(5.015)		(4.266)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	118,859	118,859	118,859	118,859	118,859	118,859
R-squared	0.005	0.005	0.004	0.004	0.008	0.008
Number of firms	15,535	15,535	15,535	15,535	15,535	15,535
Cragg-Donald Wald F statistic	30630	30633	30630	30633	30630	30633
Sargan statistic	0.332	0.254	0.198	0.170	1.101	0.856
Sargan test p-value	0.565	0.615	0.656	0.680	0.294	0.355

Standard errors are in parentheses. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.

Notes: We use *RER_Asia, RER_EU/NA, Lag_Asia_affiliate* and *Lag_EU/NA_affiliate* as IVs.

In the meantime, changes in the exchange rate may directly affect domestic employment dynamics through changes in export prices and the export behavior of firms (Klein et al., 2003). To shut down this direct channel from exchange rate to job creation and destruction through exports, we rerun Eqs. (1) and (2), while including the export intensity of firms, which is defined as the export value over total revenue. The results are shown in Table A2 of Appendix 1. To control for the potential impact from past employment status, we also include the first lag of employment (in log) in the estimation, the results of which are shown in Table A3. Both of the above additional tests provide findings that are consistent with the previous practice.

One might also argue that FDI firms might have different decision-making regarding their investment behavior from firms that are fully home operated. To address this concern, we remove the samples that do not have any overseas affiliates and repeat the aforementioned practice. The OLS estimation results are presented in Table A4 of Appendix 1, the predictions of which remain consistent with the previous results.[15]

Another point is the coverage of industries. In the previous estimations, we have been using the full sample, which includes both manufacturing and non-manufacturing industries (we use two-digit codes, and there are 27 industries in total). However, the impact of FDI on employment can be considered different between manufacturing and non-manufacturing industries. To confirm whether our previous findings are robust to industry heterogeneity, we limit the estimation to firms that are located in manufacturing industries only. The results are presented in Table A5 of Appendix 1, where the predictions remain unchanged.

In summary, the empirical findings suggest that the effect of FDI on job creation and destruction may differ depending on where investment goes: an increase in FDI to Asia raises job creation and reduces job destruction, while that to Europe/North America reduces both job creation and destruction. But through what kind of channels do the causality exist? A further explanation from the theoretical perspective can help us disentangle the empirical findings.

[15] We also conduct the IV estimation using both the initial (mean_FDI_affiliate) and the new instruments (exchange rate & lag_FDI) and come up with robust results.

IV. Theoretical model

We provide a simple model to explain the empirical findings on the effect of FDI on domestic job creation and destruction. The base model is a search-and-matching model with heterogeneous jobs developed by Wasmer (1999). Firms have two types of jobs in domestic activities: high-skilled and low-skilled. We assume that an exogenous increase in FDI raises labor demand in a way that makes the separation (or destruction) of both types of domestic jobs less likely.[16] The expansion of foreign activities requires the support of headquarters and home branches through administration, customization, production for exports, and so forth. How much demand for a high-skilled job increases relative to the other, however, depends on the destination of FDI. This differential impact of FDI on demand for heterogeneous jobs is the key to our theoretical mechanism. Here, we provide a sketch of the model and relegate derivations to the Theory Appendix.

Overview of a search-and-matching model with two types of jobs

The economy consists of a continuum of risk-neutral, infinitely lived workers of size L and a continuum of risk-neutral, infinitely lived firms of size one. The representative firm produces output Y from capital stock K and employment N. The production function, $Y = G(K, N)$, is specified as a constant-returns-to-scale for both factors.[17] The employment N consists of two types of workers: $N = N_h + N_l$, where N_j is the mass of type-$j \in \{h, l\}$ workers. The firm posts V_j of vacancies for j job type at a cost c_j. The matching process between firms and workers is costly in that unemployed workers and vacancies meet each other randomly. The existing match of type j job breaks with an exogenous Poisson separation (destruction) rate

[16] This assumption is in line with the fact that outward FDI by Japanese multinationals is complementary to exports of intermediate goods from home, which is likely to raise the demand for workers in home (Nishitateno, 2013).

[17] Because all firms are symmetric and the mass of firms is one, variables for individual firms are also aggregate ones. Thus, we omit the index of firms.

s_j. The two types of jobs differ in the following way: the firm finds it costlier to search for high-skilled workers than low-skilled workers: $c_h > c_l$ but tends to continue the match with high-skilled workers longer than that with low-skilled workers: $s_h < s_l$. The higher hiring cost for the high-skilled worker pays off in the longer continuation of match, while the lower hiring cost for the low-skilled worker comes at the expense of the shorter continuation.

The matching process is governed by a constant-returns-to-scale matching function, $m(U,V) = U^{\eta}V^{1-\eta}$, where U is the mass of unemployed workers, $V = V_h + V_l$ is the mass of vacancies and $\eta \in (0,1)$ the matching elasticity. $m(\cdot)$ is the Poisson arrival rate so that there are on average $m\Delta t$ matches during a short time interval Δt. We assume that the matching is formed sequentially. First, $m(U,V)$ matches are formed on average per unit of time between ex ante identical unemployed workers and total vacancies. Then, $m(U,V_h)$ matched workers out of $m(U,V)$ get employed in the high-skilled job, while the remaining $m(U,V) - m(U,V_h)$ matched workers in the low-skilled job. The Poisson arrival rate of matching for a vacancy $j \in \{h,l\}$ with an unemployed worker, denoted by q_j, is thus:

$$q_h \equiv \frac{m(U,V)}{V_h} \cdot \frac{m(U,V_h)}{m(U,V)} = (\theta v_h)^{-\eta} \tag{3}$$

$$q_l \equiv \frac{m(U,V)}{V_l} \cdot \frac{m(U,V) - m(U,V_h)}{m(U,V)} = \frac{q - v_h q_h}{1 - v_h} = \frac{\theta^{-\eta}\left(1 - v_h^{1-\eta}\right)}{1 - v_h} \tag{4}$$

where $\theta \equiv V/U$; $v_j \equiv V_j/V$; and $q \equiv m(U,V)/V = m(1/\theta, 1) = \theta^{-\eta}$. Given the vacancy-unemployment share θ, both arrival rates decrease with the share of high-skilled vacancy v_h. Higher v_h makes each high-skilled vacancy more difficult to match with an unemployed worker (lower q_h). It also raises the mass of high-skilled match (higher $m(U,V_h)/V = v_h q_h$) and, thus, crowds out low-skilled matches (lower q_l). The Poisson arrival rate of matching for an unemployed worker with a vacancy j is defined similarly.

Job creation is measured by the number of vacancies that find workers. Aggregate job creation and high/low-skilled job creations (per unit of time) are given by:

$$JC = q \cdot V = \theta^{-\eta} V \tag{5}$$

$$JC_h = q_h \cdot V_h = \theta^{-\eta} {v_h}^{1-\eta} V \tag{6}$$

$$JC_l = q_l \cdot V_l = \theta^{-\eta} \left(1 - v_h^{1-\eta}\right) V, \tag{7}$$

Similarly, job destruction is measured by the mass of newly separated matches. Aggregate job destruction and high/low-skilled job destructions (per unit of time) are given by:

$$JD = s_h \cdot N_h + s_l \cdot N_l \tag{8}$$

$$JD_j = s_j \cdot N_j \tag{9}$$

where $n_j \equiv N_j / N$ is the employment share of job j.

Firm's problem and labor demand

Each firm maximizes the expected value of discounted lifetime profits by choosing time schedules of capital investment I, capital stock K, each type of vacancy V_j, and each type of employment N_j. I and V_j are the control variables and can change instantaneously, while K and N_j are the state variables and can change only gradually.[18] Solving the maximization problem gives the usual marginal productivity condition for each type of job:

$$G_N = w_h + \frac{(r + s_h) c_h}{q_h} \tag{LDh}$$

[18] Letting $\dot{N}_j$ be the time derivative of employment j, employment j evolves according to $\dot{N}_j = JC_j - JD_j$, where JC_j is job creation of j defined (Eqs. (6) and (7)) and JD_j is job destruction of j (Eq.(9)).

$$G_N = w_l + \frac{(r + s_l)c_l}{q_l} \quad \text{(LDl)}$$

where $G_N \equiv \partial G/\partial N = \partial G/\partial N_j$ is the marginal product of labor, w_j is the wage of labor, j r is the exogenous interest rate, and q_j is the filling rate of the job j defined in Eqs. (3) and (4). The marginal product of labor j, G_j, must be equal to the marginal cost of hiring a worker j that consists of the wage, w_j, and the expected recruitment cost for the worker, $(r + s_j)c_j/q_j$, since the expected duration of a high-skilled-job vacancy finding a worker is $1/q_j$. Given the share of high-skilled vacancy, v_j, both equations show a downward sloping curve in (θ, w_j) space. Higher wages w_j discourage firms from posting vacancies, leading to a less tighter labor market (lower θ). We call the two equations the *labor demand curves*.

Wage setting and the share of high-skilled vacancy

When a new match is formed, the firm and the worker engage in a bargain to determine wages in a way of generalized Nash bargaining in which the equilibrium wage maximizes a weighted product of each party's return from the job match. The resulting outcome is:

$$w_j = (1 - \beta)z + \beta \left[G_N + \sum_{j=h,l} (\theta v_j) c_j \right] \quad \text{(WS)}$$

where $\beta \in (0,1)$ is a parameter capturing the worker's bargaining power and z is an unemployment benefit. $\sum_{j=h,l} \theta v_j c_j = \sum_{j=h,l} c_j V_j / U$ represents the average cost of posting vacancies for each unemployed worker and increases with the high-skilled-vacancy share v_h because $c_h > c_l$. The worker demands a higher wage when her outside payoff is greater (higher z) and/or the firm's opportunity cost of keeping vacancies unfilled is greater (higher G_N and $\sum_{j=h,l} \theta v_j c_j$). We also note that the right-hand side of (WS) does not depend on the job type, implying $w_h = w_l = w$, partly because both types of jobs have the same marginal product. The equation (WS), which we call the *wage setting curve*, has an upward-slope in (w, θ) space. The steady-state equilibrium is the intersection of the labor supply and demand curves, as shown in Figure 1.

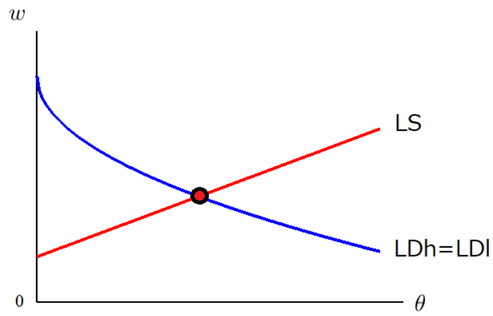

Figure 1. Labor demand and wage setting curves

From (LDh) and (LDl), we have:

$$G_N - \frac{(r + s_h)c_h}{q_h} = G_N - \frac{(r + s_l)c_l}{q_l}$$

or,

$$v_h^{\eta} + (\tilde{c} - 1)v_h - \tilde{c} = 0 \qquad (10)$$

where $\tilde{c} \equiv (r + s_l)c_l/[(r + s_h)c_h]$ measures the hiring cost of low-skilled jobs relative to high-skilled jobs: it is greater when the relative hiring cost is high (higher c_l/c_h) and/or the realistic duration of match is shorter (higher s_l/s_h). Eq. (10) is the condition under which the firm is indifferent to posting either a high-skilled vacancy or a low-skilled vacancy in a steady state. The marginal product of the labor net of the expected flow of hiring cost must be equal between the two jobs, determining the high-skilled-vacancy share v_h. If the relative hiring cost of a low-skilled worker is sufficiently low such that $\tilde{c} < 1 - \eta$, Eq. (10) has a solution of $v_h \in$

$(0{,}1)$. In the following, we assume this inequality for the two types of jobs to coexist in the steady state. As $\tilde{c}$ is higher, the firm shifts emphasis on recruiting high-skilled workers rather than low-skilled ones, leading to higher v_h.

In steady state, the outflows from and the inflows to the unemployment pool for each type of worker must be equal. That is, for each type j, $JC_j = JD_j$ must hold.

$$(\theta v_h)^{1-\eta} uL = s_h n_h (1-u)L$$

$$\theta^{1-\eta}\left(1 - v_h^{1-\eta}\right) uL = s_l (1-n_h)(1-u)L$$

where we note $JC_j = q_j V_j = \theta_j q_j U$. These equations are also known as the Beveridge Curves (Pissarides, 2000). In summary, the high-skilled-vacancy share v_h is pinned down by the indifference condition (8); the vacancy–unemployment ratio θ and the wage w are by labor supply (LS) and labor demand (LD); the high-skilled-employment share n_h and the unemployment rate u are determined by the Beveridge Curves.

Effect of FDI on domestic job creation and destruction

We model FDI as an exogenous shock to the firm. We assume that FDI decreases the separation rate s_j because FDI increases the demand for both types of domestic jobs. Domestic headquarters and branches need to support expanding foreign activities concerning both high- and low-skill intensive activities through administration, product/service customization, production for exports, and so forth.

However, the effect is assumed to vary in the destination of FDI. Japanese firms establish affiliates in Asian countries mainly for seeking low-cost factors such as labor and land, which is known as vertical FDI. Headquarters and plants in Japan concentrate on the production of high value-added parts and components and export the intermediate goods to their plants in

Asia for assembly (Fujita and Hamaguchi, 2012). This assumption is motivated by the facts that vertical intra-industry trade driven by factor-cost difference is prominent in Asia than in other regions (Fukao et al., 2003; Kimura et al., 2007). FDI to Asia promotes exports and domestic production, thereby making low-skilled jobs more valuable than high-skilled jobs. The relative reduction in the separation rate of low-skilled jobs can be considered sufficiently high, that is, $\partial s_l/\partial FDI^{Asia} << \partial s_h/\partial FDI^{Asia} < 0$.[19]

Conversely, Japanese multinationals engage in FDI to European and North American countries mainly for saving trade costs and seeking new markets, known as horizontal FDI. They tend to replace exports by local production to save transportation costs and reduce domestic production. In fact, Nishitateno (2013) finds that complementarity between Japanese FDI and exports to Europe/North America is weaker than that between Japanese FDI and exports to Asia. FDI to Europe and North America does not significantly increase the need for low-skilled jobs relative to that for high-skilled jobs.[20] This implies that the relative reduction in the separation rate of high-skilled jobs is sufficiently high, that is, $\partial s_h/\partial FDI^{EU,NA} << \partial s_l/\partial FDI^{EU,NA} < 0$.[21]

Responding to a decline in the separation rate, the high-skilled-vacancy share v_h and the vacancy–unemployment ratio θ change immediately because firms can instantaneously adjust vacancies V_j. By contrast, the adjustment of employment N_j and the unemployment rate u take time and change gradually. In the following, we will consider the effect of FDI in the short run, where vacancies can react while un/employment remains unchanged.

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[19] The exact condition is given by $\frac{\partial s_h}{\partial FDI^{Asia}} / \frac{\partial s_l}{\partial FDI^{Asia}} \in [0, S^a)$, where $S^a \equiv \Gamma_2/\Gamma_1$; $\Gamma_1 \equiv c_h(r + s_h)[x\{\eta\tilde{c} - v_h(1-\eta)(1-\tilde{c})\} + \beta\theta c_l\tilde{c}(1-v_h)]$; $\Gamma_2 \equiv \beta\theta c_l^2(r+s_h)(1-v_h)$; and $x \equiv (1-\beta)(G_N - z) - \beta\theta\sum_j v_j c_j$, which we assume to be positive. See Theory Appendix for details.

[20] Hayakawa et al. (2013) find that Japanese firms that started horizontal FDI, defined as FDI to developed countries, increased demand for non-production workers in home.

[21] The exact condition is given by $\frac{\partial s_h}{\partial FDI^{EU,NA}} / \frac{\partial s_l}{\partial FDI^{EU,NA}} \in [S^d, \infty)$, where $S^d \equiv \Theta_2/\Theta_1$; $\Theta_1 \equiv v_h c_h(r + s_h)[\beta\theta(1-v_h)\,\tilde{c}(c_h - c_l) + x]$; and $\Theta_2 \equiv c_l(r+s_h)(1-v_h)[\eta x + \beta\theta v_h(c_h - c_l)]$. See Theory Appendix for details.

FDI to Asia

When the separation rate of the low-skilled match declines more sharply than that of the high-skilled match as a result of FDI to Asia, firms find it more profitable to match low-skilled workers relative to high-skilled ones. To equalize the profitability of hiring the two types of workers, firms increase the share of low-skilled vacancy, $v_l = 1 - v_h$, with a lower search cost of $c_l(< c_h)$. This change in the composition of vacancies reduces the average search cost per unemployed worker (lower $\sum_{j=h,l} c_j \theta v_j = \sum_{j=h,l} c_j V_j / U$) and strengthens the bargaining position of firms against workers. Workers are unable to demand higher wages than before, making (WS) shift down. Besides, based on the setting where high-skilled vacancies are filled first and the low-skilled ones next, the filling rate of low-skilled vacancy q_l increases owing to the fewer high-skilled vacancies. Thus, firms increase low-skilled vacancies more than they reduce high-skilled vacancies, making the labor market tighter, as reflected in the rightward shift of (LD). Both shifts of (WS) and (LD) result in a higher vacancy–unemployment ratio θ, as shown in Figure 2.

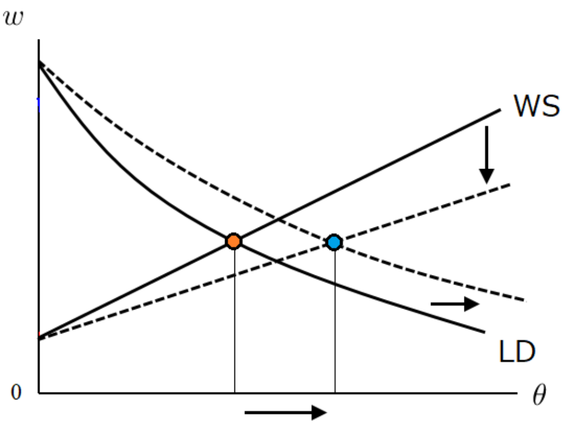

Figure 2. The effect of FDI to Asia

From Eqs. (5) and (8), the effect of FDI on domestic job creation and destruction is given by:

$$\frac{\partial JC}{\partial FDI^{Asia}} = (1-\eta)\theta^{-\eta}\theta' U > 0$$

$$\frac{\partial JD}{\partial FDI^{Asia}} = \sum_{j=h,l} s_j{}' N_j < 0$$

where $\theta' \equiv \partial\theta/\partial FDI^{Asia} > 0$ and $s_j' \equiv \partial s_j/\partial FDI^{Asia} < 0$. Because of FDI to Asia, both types of job matches are likely to continue longer so that fewer existing matches are destroyed. The effect of longer duration is greater for low-skilled jobs with lower search costs. The total number of vacancies firms post increases, resulting in more job creation. This result is in line with our empirical findings.

By decomposing the effect into job creation and destruction of each type of job (Eqs. (6), (7) and (9)), we can see:

$$\frac{\partial JC_h}{\partial FDI^{Asia}} = q_h' V_h + q_h V_h' = (1-\eta)(\theta v_h)^{1-\eta}(\theta'/\theta + v_h'/v_h)U < 0 \tag{11}$$

$$\frac{\partial JC_l}{\partial FDI^{Asia}} = \frac{\partial JC}{\partial FDI^{Asia}} - \frac{\partial JC_h}{\partial FDI^{Asia}} > 0 \tag{12}$$

$$\frac{\partial JD_j}{\partial FDI^{Asia}} = s_j{}' N_j < 0 \quad \text{for } j \in \{h, l\} \tag{13}$$

where $v_h{}' \equiv \partial v_h/\partial FDI^{Asia} < 0$; $v_h^{\eta-1} > 1$; and $\theta'/\theta + v_h'/v_h > 0$. The proofs are given in the Theory Appendix. Although FDI to Asia increases total job creation, it decreases the creation of high-skilled jobs by shifting the share of vacancies from high-skilled to low-skilled jobs.

FDI to Europe/North America

Contrary to FDI to Asia, FDI to Europe and North America causes a much greater decline in the separation rate of the high-skilled match than that of the low-skilled match. The effect here is exactly opposite to the effect of FDI to Asia. Due to the higher profitability of high-skilled jobs, firms raise their share of total vacancies (higher v_h). Higher v_h increases the average search cost per unemployed worker and, thus, the firms' opportunity cost of keeping vacancies unfilled. Firms must agree on a higher wage demanded by workers, shifting (WS) up. Because of the higher v_h reducing the filling rate of high-skilled vacancies, firms reduce both high-skilled and low-skilled vacancies, making (LD) shift leftward. These shifts translate into a lower vacancy–unemployment ratio θ, as shown in Figure 3.

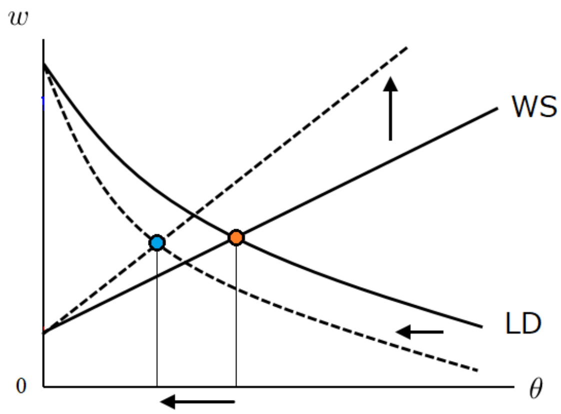

Figure 3. The effect of FDI to Europe/North America

From Eqs. (5) and (8), the effect of FDI on total job creation and destruction is

$$\frac{\partial JC}{\partial FDI^{EU,NA}} = (1-\eta)\theta^{-\eta}\theta' U < 0$$

$$\frac{\partial JD}{\partial FDI^{EU,NA}} = \sum_{j=h,l} s_j{}' N_i < 0$$

where $' \equiv \partial\theta/\partial FDI^{EU,NA} < 0$ and $s_j' \equiv \partial s_j/\partial FDI^{EU,NA} < 0$. This is consistent with our empirical findings.

From Eqs. (6), (7), and (9), we derive the effect of FDI on each type of job creation and destruction as.

$$\frac{\partial JC_h}{\partial FDI^{EU,NA}} = q_h'V_h + q_hV_h' = (1-\eta)(\theta v_h)^{1-\eta}(\theta'/\theta + v_h'/v_h)U > 0 \tag{14}$$

$$\frac{\partial JC_l}{\partial FDI^{EU,NA}} = \frac{\partial JC}{\partial FDI^{EU,NA}} - \frac{\partial JC_h}{\partial FDI^{EU,NA}} < 0 \tag{15}$$

$$\frac{\partial JD_j}{\partial FDI^{EU,NA}} = s_j{}'N_j < 0 \quad \text{for } j \in \{h,l\} \tag{16}$$

where $v_h' \equiv \partial v_h/\partial FDI^{EU,NA} < 0$; $v_h^{\eta-1} > 1$; and $\theta'/\theta + v_h'/v_h > 0$. The proofs are given in the Theory Appendix. Contrary to FDI to Asia, FDI to Europe/North America induces firms to create more high-skilled jobs and fewer low-skilled jobs.

Empirical evidence on the mechanism

To explain why the effect of FDI on domestic jobs varies in its destination, the theoretical model highlights the role of heterogeneous jobs and gives new testable implications. That is, (i) an increase in FDI to Asia creates more low-skilled jobs and fewer high-skilled jobs (Eqs. (11) and (12)); (ii) an increase in FDI to EU/North America creates more high-skilled jobs and fewer low-skilled jobs (Eqs. (14) and (15)); (iii) an increase in FDI to either destination reduces the destruction of both types of jobs (Eqs. (13) and (16)): [22]

We take a step further to empirically investigate the three predictions from (i) to (iii). Because detailed information on the skill level of employees is not available, we instead use

[22] We start from our theory by assuming that FDI has different impacts on the job separation rate, s_i. Ideally, we need to check this to verify the mechanism. However, our limited data does not enable us to further investigate s_i. We take an indirect approach instead; we derive new theoretical predictions on FDI impact of domestic job creation and destruction of *each type of job* and then empirically test them.

the information on division-level characteristics. We suppose that employees working in some divisions are high-skilled labor, while those in other divisions are low-skilled. The classification closely follows that proposed by Autor and Dorn (2013) and is given in Table 5.

TABLE 5

Classification of low/high skilled jobs

Division	Skill type
Research & planning	High
Information	High
Research & development	High
International business	High
Human resources, accounting, other management	Low
Manufacturing, mining, electricity, gas	Low
Commerce	Low
Restaurants	Low
Research	High
Services	Low
Warehouse, transportation, delivery	Low
Other domestic	Low

We then construct the measures of firm-skill level job creation and destruction and repeat the same regressions as in Section 3. The results are summarized in Table 6. The signs of the coefficients of interest are consistent with our predictions, although some of them are statistically insignificant. From columns (1) and (2), we see that an increase in the number of Asian affiliates has a negative effect on high-skilled job creation and a positive effect on low-skilled job creation, which is in line with (i). As predicted by (ii), we also see that an increase in the number of European/North American affiliates has an exact opposite effect on high/low-skilled-job creation. We confirm the third prediction: the negative effect of FDI into Europe/North America on high/low skilled-job distribution from columns (3) and (4).

TABLE 6

Analysis by high skilled and low skilled divisions (IV method)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	JC_high	JC_high	JC_low	JC_low	JD_high	JD_high	JD_low	JD_low
Asia_affiliate	-0.396	-0.859	16.86**	12.86**	-1.081	-1.257	-12.19**	-12.16**

			*					
	(2.009)	(2.015)	(5.408)	(5.424)	(1.897)	(1.903)	(5.753)	(5.770)
EU_NA_affiliate	6.619**	6.297**	-40.24***	-42.56***	-0.0560	-0.165	-43.20***	-43.40***
	(2.590)	(2.592)	(6.972)	(6.978)	(2.446)	(2.448)	(7.416)	(7.423)
Capital_labor_ratio	-5.654***	-4.841***	-58.06***	-54.50***	-2.108*	-1.903*	7.709***	9.366***
	(1.181)	(1.202)	(3.179)	(3.237)	(1.115)	(1.136)	(3.381)	(3.443)
R&D share	3.277	4.793	-20.99	-0.640	2.310	3.106	3.494	-0.228
	(8.402)	(8.387)	(22.62)	(22.58)	(7.934)	(7.921)	(24.06)	(24.02)
Foreign_capital_share	-0.0228**	-0.0228**	-0.0279	-0.0261	0.0101	0.0102	-0.0229	-0.0239
	(0.0106)	(0.0106)	(0.0285)	(0.0285)	(0.00998)	(0.00998)	(0.0303)	(0.0303)
Firm_age	-0.000979	-0.000934	0.0323	0.0327	-0.00430	-0.00429	0.0400	0.0400
	(0.00906)	(0.00906)	(0.0244)	(0.0244)	(0.00855)	(0.00855)	(0.0259)	(0.0259)
TFP_LP	3.977**		-15.61***		0.00725		24.52***	
	(1.869)		(5.031)		(1.765)		(5.351)	
ln_Revenue		6.743***		21.18***		1.450		17.90***
		(1.657)		(4.461)		(1.565)		(4.746)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	122,578	122,578	122,578	122,578	122,578	122,578	122,578	122,578
Number of firms	19,254	19,254	19,254	19,254	19,254	19,254	19,254	19,254

Standard errors are in parentheses. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.

Notes: We use *mean_Asia_affiliate* and *mean_EU_NA_affiliate* as IVs.

V. Conclusion

We examined the effect of outward FDI on home employment using unique firm-establishment-division level panel data in Japan. Contrary to most previous studies focusing only on net employment growth, we have decomposed it into job creation and job destruction. This decomposition tells us where net employment growth comes from, that is, positive net growth resulting from more jobs created, from fewer jobs destructed, or both. Such information is essential for ensuring the flexibility of the labor market, which is a key factor for a country benefiting from globalization.

The results show that although both investments in Asia and Europe/North America have a positive effect on the net employment growth of a firm, they have opposite effects on job creation, positive and negative, respectively. Compared with investment in Europe and North America, investment in Asia favors unemployed workers and/or existing employees in other firms, contributing to active adjustment in the Japanese labor market. To explain the results, we have modeled heterogeneous jobs, high-skilled and low-skilled ones, in a frictional search-and-matching framework and argued that FDI to different regions may lead to different labor reallocation decisions between the two types of jobs. FDI to Asia raises the demand for low-skilled jobs with low hiring costs more than demand for high-skilled jobs with high hiring costs, leading to more aggregate job creations. Contrastingly, FDI to Europe/North America increases the demand for high-skilled jobs more, reducing aggregate job creations. Such a mechanism is also verified empirically.

The limitation of this study is that the data does not include very small firms who employ <50 workers or with < 30,000,000 yen worth of capital. Most firms in this category could be immature firms or ventures, whose behaviors and FDI effects could differ from those of large and mature firms. Thus, the findings are only limited to medium-sized and large firms in Japan. Furthermore, detailed FDI activities and the motivation for foreign investment are unavailable in the current data. We will leave these for future studies.

Appendix

Appendix 1. Additional tables

TABLE A1

Summary statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
Job creation (person)	642463	47.48	379.43	0	126237
Job destruction (person)	642463	44.54	351.13	0	99996
Net employment (person)	546261	3.64	388.48	-99691	126132
Revenue (million yen)	642463	22869.31	177307.10	1	1.59E+07
R&D expense/revenue	286415	0.01	0.16	0	57.10
Firm age	642461	44.53	96.36	0	2005
Total regular employee (person)	642463	432.45	1775.64	50	153405
Foreign capital share (100%)	642384	2.09	12.23	0	100
Capital/labor ratio (log)	642463	-0.28	1.22	-7.34	7.96
TFP_LP (log)	642463	6.71	1.12	-1.74	13.28
Total number of affiliates	284125	2.92	18.33	0	1346
Total number of overseas affiliates	284125	2.32	18.41	0	1327
Number of Asian affiliates	284125	1.29	7.21	0	524
Number of European affiliates	284125	0.38	4.57	0	360
Number of North American affiliates	284125	0.42	5.54	0	735
Exchange rate	642463	97.47	15.97	71.28	130.91
Export/revenue	642463	0.02	0.10	0	1

TABLE A2

Baseline results with export control

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	JC	JC	JD	JD	Net	Net
Asia_affiliate	20.53***	17.31***	-0.373	-0.451	28.28***	25.10***
	(3.649)	(3.654)	(3.734)	(3.740)	(3.677)	(3.685)
EU_NA_affiliate	-8.509*	-10.41**	-41.07***	-41.29***	49.79***	48.21***

	(4.570)	(4.572)	(4.676)	(4.679)	(4.534)	(4.538)
Capital_labor_ratio	-50.75***	-46.46***	9.907***	11.84***	-69.18***	-67.02***
	(2.810)	(2.859)	(2.876)	(2.926)	(2.905)	(2.957)
R&D share	-8.925	6.795	10.22	7.454	-23.52	1.079
	(18.72)	(18.70)	(19.16)	(19.14)	(20.58)	(20.55)
Foreign_capital_share	-0.0900***	-0.0904***	-0.0969***	-0.0979***	-0.0446*	-0.0417
	(0.0212)	(0.0212)	(0.0217)	(0.0217)	(0.0257)	(0.0257)
Export_intensity	-0.00672	-0.00665	-0.00312	-0.00325	-0.00322	-0.00269
	(0.0151)	(0.0151)	(0.0154)	(0.0154)	(0.0223)	(0.0223)
Firm_age	5.134	-2.238	-27.78**	-27.25**	31.78**	22.89*
	(13.26)	(13.26)	(13.57)	(13.57)	(13.36)	(13.36)
TFP_LP	-2.955		25.76***		-38.72***	
	(4.441)		(4.544)		(4.576)	
ln_Revenue		29.99***		19.79***		5.379
		(3.914)		(4.006)		(4.046)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	151,727	151,727	151,727	151,727	128,763	128,763
R-squared	0.007	0.007	0.006	0.006	0.009	0.009
Number of firms	23,368	23,368	23,368	23,368	20,579	20,579

Standard errors are in parentheses. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.

Notes: "Net" in columns (5) and (6) is defined as the difference between JC and JD.

TABLE A3

Baseline results with Lag_employment control

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	JC	JC	JD	JD	Net	Net
Asia_affiliate	16.96***	13.07***	-22.48***	-19.22***	42.96***	35.69***
	(4.201)	(4.201)	(4.293)	(4.292)	(3.606)	(3.592)
EU_NA_affiliate	-15.45***	-17.01***	-67.61***	-66.21***	63.37***	60.37***
	(5.206)	(5.203)	(5.321)	(5.317)	(4.469)	(4.449)
Lag_employment	-59.07***	-93.06***	220.8***	254.6***	-283.7***	-352.6***
	(5.697)	(6.175)	(5.822)	(6.310)	(4.890)	(5.280)
Capital_labor_ratio	-70.90***	-69.18***	52.65***	49.68***	-125.3***	-120.5***
	(3.517)	(3.514)	(3.595)	(3.591)	(3.019)	(3.005)
R&D share	-10.20	22.95	-28.40	-53.42**	23.34	82.48***
	(23.63)	(23.60)	(24.15)	(24.11)	(20.28)	(20.18)

Foreign_capital_share	-0.0217	-0.0167	-0.0294	-0.0330	-0.0134	-0.00468
	(0.0295)	(0.0295)	(0.0302)	(0.0301)	(0.0253)	(0.0252)
Firm_age	0.0247	0.0254	0.0310	0.0304	-0.00368	-0.00221
	(0.0256)	(0.0256)	(0.0261)	(0.0261)	(0.0220)	(0.0219)
TFP_LP	4.551		-35.21***		40.08***	
	(5.468)		(5.588)		(4.693)	
ln_Revenue		63.94***		-80.14***		146.1***
		(5.238)		(5.352)		(4.479)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	128,762	128,762	128,762	128,762	128,762	128,762
R-squared	0.006	0.007	0.018	0.019	0.039	0.048
Number of firms	20,578	20,578	20,578	20,578	20,578	20,578

Standard errors are in parentheses. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.

Notes: "Net" in columns (5) and (6) is defined as the difference between JC and JD.

TABLE A4

OLS results using samples for FDI-firms only

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	JC	JC	JD	JD	Net	Net
Asia_affiliate	25.33***	19.93***	-2.889	-3.374	39.78***	34.60***
	(6.222)	(6.239)	(6.164)	(6.183)	(6.134)	(6.155)
EU_NA_affiliate	-14.80**	-17.51***	-41.33***	-41.72***	43.08***	40.83***
	(6.245)	(6.252)	(6.187)	(6.196)	(6.082)	(6.090)
Capital_labor_ratio	-56.53***	-52.06***	11.39**	13.08***	-78.30***	-75.50***
	(4.971)	(5.042)	(4.926)	(4.997)	(4.967)	(5.041)
R&D share	-15.16	6.051	3.063	2.624	-24.33	0.608
	(31.71)	(31.66)	(31.42)	(31.37)	(32.39)	(32.35)
Foreign_capital_share	-0.168***	-0.171***	-0.169***	-0.170***	-0.0923*	-0.0943*
	(0.0382)	(0.0382)	(0.0379)	(0.0379)	(0.0490)	(0.0490)
Firm_age	0.000476	0.00150	0.00501	0.00495	0.00299	0.00396
	(0.0273)	(0.0273)	(0.0270)	(0.0270)	(0.0391)	(0.0391)
TFP_LP	-11.58		19.43**		-40.42***	
	(8.193)		(8.117)		(8.088)	
ln_Revenue		34.17***		18.35**		12.10*
		(7.223)		(7.158)		(7.151)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	69,169	69,169	69,169	69,169	61,471	61,471
Number of firms	0.007	0.008	0.008	0.008	0.010	0.010

Standard errors are in parentheses. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.

TABLE A5

OLS results using samples in manufacturing industries only

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	JC	JC	JD	JD	Net	Net
Asia_affiliate	17.75***	15.34***	-0.823	-1.105	27.44***	25.16***
	(3.516)	(3.523)	(3.462)	(3.469)	(3.835)	(3.844)
EU_NA_affiliate	-14.42***	-15.76***	-34.12***	-34.36***	31.41***	30.29***
	(4.435)	(4.437)	(4.366)	(4.369)	(4.738)	(4.741)
Capital_labor_ratio	-36.41***	-32.83***	6.399**	7.701**	-50.71***	-48.29***
	(3.050)	(3.103)	(3.002)	(3.055)	(3.396)	(3.456)
R&D share	-31.95	-20.72	-5.664	-6.570	-35.81	-19.94
	(25.55)	(25.51)	(25.15)	(25.12)	(30.19)	(30.15)
Foreign_capital_share	-0.119***	-0.120***	-0.136***	-0.137***	-0.0474	-0.0471
	(0.0220)	(0.0220)	(0.0216)	(0.0216)	(0.0293)	(0.0293)
Firm_age	-0.000735	-0.000454	0.00645	0.00644	-0.00443	-0.00388
	(0.0144)	(0.0144)	(0.0141)	(0.0141)	(0.0235)	(0.0235)
TFP_LP	1.299		14.70***		-18.94***	
	(4.562)		(4.491)		(5.029)	
ln_Revenue		23.40***		13.57***		7.984*
		(4.025)		(3.964)		(4.446)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	93,040	93,040	93,040	93,040	80,626	80,626
R-squared	0.007	0.008	0.008	0.008	0.008	0.008
Number of firms	12,279	12,279	12,279	12,279	11,017	11,017

Standard errors are in parentheses. *** Significant at 1%. ** Significant at 5%. * Significant at 10%.

Appendix 2. Real effective exchange rate

We construct the regional real exchange rate as follows. The bilateral real exchange rate of Japan against country c in year t is

$$RER_{c,t} = \frac{NER_{c,t} \times CPI_{c,t}}{NER_{JPN,t} \times CPI_{JPN,t}}$$

NER_c: US dollar per country c's currency,

CPI_c: Consumer price index in country c,

where NER_c and CPI_c are taken from IMF International Financial Statistics. Supposing c is in Asia, its real exchange rate weighted by FDI stock is

$$weighted\_RER_{c,t}^{Asia} = \frac{FDI_{c,t}}{\sum_{k \in Asia} FDI_{k,t}} \times RER_{c,t}$$

FDI_c: Japanese outward FDI stock to country c,

where FDI stock data are from JETRO. The regional real exchange rate is then

$$RER_t^{Asia} = 100 \times \frac{\sum_{k \in Asia} weighted\_RER_{k,t}^{Asia}}{\sum_{k \in Asia} weighted\_RER_{k,1996}^{Asia}}.$$

We normalize the 1996 level to 100.

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Theory Appendix to "Does it matter where you invest? The impact of FDI on domestic job creation and destruction"

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January 25, 2021

1 Setting

We here provide the full analysis of the theoretical part of the paper. Some explanations are overlapped with those in the text. The base model is a search-and-matching model with heterogeneous jobs developed by Wasmer (1999). Firms have two types of jobs in domestic activities: skilled and unskilled. We assume that an exogenous increase in FDI raises labor demand in a way that makes the separation (or destruction) of both types of domestic jobs less likely.[1] The expansion of foreign activities requires the support of headquarters and home branches through administration, customization, production for exports, and so forth. How much demand for a skilled job increases relative to the other, however, depends on the destination of FDI. This differential impact of FDI on demand for heterogeneous jobs is the key to our theoretical mechanism.

The economy consists of a continuum of risk-neutral, infinitely lived workers of size L and a continuum of risk-neutral, infinitely lived firms of size one. The representative firm produces output Y from capital stock K and employment N. The production function, $Y = G(K, N)$, is specified as a constant-returns-to-scale for both factors.[2] The employment N consists of two types of workers: $N = N_h + N_l$, where N_j is the mass of type-$j \in \{h, l\}$ workers. The firm posts V_j of vacancies for j job type at a cost c_j. The matching process between firms and workers is costly in that unemployed workers and vacancies meet each other randomly. The existing match of type j job breaks with an exogenous Poisson separation (destruction) rate s_j. The two types of jobs differ in the following way: the firm finds it costlier to search for high-skilled workers than low-skilled workers: $c_h > c_l$ but tends to continue the match with high-skilled workers longer than that with low-skilled workers: $s_h < s_l$. The higher hiring cost for the high-skilled worker pays off in the longer continuation of match, while the lower hiring cost for the low-skilled worker comes at the expense of the shorter continuation.

The matching process is governed by a constant-returns-to-scale matching function, $m(U, V) = U^{\eta} V^{1-\eta}$, where U is the mass of unemployed workers, $V = V_h + V_l$ is the mass of vacancies and $\eta \in (0, 1)$ the matching elasticity. $m(\cdot)$ is the Poisson arrival rate so that there are on average

[1] This assumption is in line with the fact that outward FDI by Japanese multinationals is complementary to exports of intermediate goods from home, which is likely to raise the demand for workers in home (Nishitateno, 2013).

[2] Because all firms are symmetric and the mass of firms is one, variables for individual firms are also aggregate ones. Thus, we omit the index of firms.

$m\Delta t$ matches during a short time interval Δt. We assume that the matching is formed sequentially. First, $m(UV)$ matches are formed on average per unit of time between ex ante identical unemployed workers and total vacancies. Then, $m(U, V_h)$ matched workers out of $m(U, V)$ get employed in the high-skilled job, while the remaining $m(U, V) - m(U, V_h)$ matched workers in the low-skilled job. The Poisson arrival rate of matching for a vacancy $j \in \{h, l\}$ with an unemployed worker, denoted by q_j, is thus:

$$q_h \equiv \frac{m(U,V)}{V_h} \cdot \frac{m(U,V_h)}{m(U,V)} = (\theta v_h)^{-\eta},$$

$$q_l \equiv \frac{m(U,V)}{V_l} \cdot \frac{m(U,V) - m(U,V_h)}{m(U,V)} = \frac{q - v_h q_h}{1 - v_h} = \frac{\theta^{-\eta}\left(1 - v_h^{1-\eta}\right)}{1 - v_h},$$

where $\theta \equiv V/U$; $v_j \equiv V_j/V$; and $q \equiv m(U,V)/V = m(1/\theta, 1) = \theta^{-\eta}$. Given the vacancy-unemployment share θ, both arrival rates decrease with the share of high-skilled vacancy v_h. Higher v_h makes each high-skilled vacancy more difficult to match with an unemployed worker (lower q_h). It also raises the mass of high-skilled match (higher $m(U, V_h)/V = v_h q_h$) and, thus, crowds out low-skilled matches (lower q_l). The Poisson arrival rate of matching for an unemployed worker with a vacancy j is defined similarly.

Job creation is measured by the mass of vacancies that match with unemployed workers. Aggregate job creation and high/low-skilled job creations (per unit of time) are given by:

$$JC = q \cdot V = \theta^{-\eta} V = \theta^{1-\eta},$$

$$JC_h = q_h \cdot V_h = \theta^{-\eta} v_h^{1-\eta} V = \theta^{1-\eta} v_h^{1-\eta} U,$$

$$JC_l = JC - JC_h = \theta^{-\eta}\left(1 - v_h^{1-\eta}\right) V = \theta^{1-\eta}\left(1 - v_h^{1-\eta}\right) U.$$

Similarly, job destruction is measured by the mass of newly separated matches. Aggregate job destruction and high/low-skilled job destructions (per unit of time) are given by:

$$JD = \sum_{j=h,l} s_j \cdot N_j,$$

$$JD_j = s_j \cdot N_j,$$

where $n_j \equiv N_j/N$ is the employment share of job j.

2 Firm's problem

The representative firm chooses the infinite-time schedule of capital investment I, capital stock K, the mass of each type of vacancy V_j, and each type of employment N_j, to maximize the discounted sum of the stream of future profits:

$$\max_{\{I(t),K(t),V_h(t),V_l(t),N_h(t),N_l(t)\}} \int_0^\infty e^{-rt}\left[G(K(t),N(t)) - \sum_{j=h,l}\{w_j(t)N_j(t)+c_jV_j(t)\} - I(t)\right]dt,$$

subject to the law of motion capital and the evolution of employment $j \in \{h,l\}$:

$$\dot{K}(t) = I(t) - \delta K(t),$$
$$\dot{N}_j(t) = q_j(t)V_j(t) - s_jN_j(t),$$

where the dot represents the time derivative: $\dot{x} \equiv dx/dt$. The notations are defined as follows:

r : interest rate,

$N = \sum_{j=h,l} N_j$: total employment,

w_j : wage of type-j labor,

c_j : vacancy cost for type-j job,

$q_h = (\theta v_h)^{-\eta}$: rate of a high-skilled vacancy matching with a unemployed worker,

$q_l = \theta^{-\eta}(1 - v_h^{-\eta})/(1 - v_h)$: rate of an low-skilled vacancy matching with a unemployed worker,

$v_h = V_h/V = V_h/(V_h + V_l)$: share of high-skilled vacancy,

s_j : separation rate of type-j match.

Set the Hamiltonian as

$$\mathcal{H} = G(K,N) - \sum_{j=h,l}(w_jN_j + c_jV_j) - I + \sum_{j=h,l}\lambda_j(q_jV_j - s_jN_j) + \mu(I - \delta K),$$

where λ_j and μ are associated co-state variables. The necessary conditions are

$$\frac{\partial \mathcal{H}}{\partial V_j} = -c_j + \lambda_j q_j = 0, \tag{A1}$$

$$r\lambda_j = \dot{\lambda}_j + \frac{\partial \mathcal{H}}{\partial N_j} = \dot{\lambda}_j + G_N - w_j - \lambda_j s_j,$$

$$\to \dot{\lambda}_j = (r + s_j)\lambda_j - (G_N - w_j), \tag{A2}$$

$$\frac{\partial \mathcal{H}}{\partial I} = -1 + \mu = 0, \tag{A3}$$

$$r\mu = \dot{\mu} + \frac{\partial \mathcal{H}}{\partial K} = \dot{\mu} + G_K - \mu\delta,$$

$$\to \dot{\mu} = (r + \delta)\mu - G_K, \tag{A4}$$

$$\lim_{t\to\infty} e^{-rt}\lambda_j(t)N_j(t) = 0, \qquad \lim_{t\to\infty} e^{-rt}\mu(t)K(t) = 0,$$

where G_K and G_N respectively represent the derivative of $G(\cdot,\cdot)$ with respect to its first and second argument. In what follows, we will focus on steady states where $\dot{\lambda}_h = \dot{\lambda}_l = \dot{\mu} = 0$ and suppress the time index unless otherwise noted. From (A1) and (A2), we have

$$w_j = G_N - (r + s_j)c_j/q_j. \tag{A5}$$

From (A3) and (A4), we have

$$G_K = r + \delta, \tag{A6}$$

which pins down the capital-labor ratio: $k \equiv K/N$. Letting $g(k) \equiv G(K/N, 1)$, the property of constant-returns-to-scale implies that $G_K = g'(k)$ and $G_N = g(k) - kg'(k)$. Once k is pinned down by (A6), G_N is also determined.

3 Wage bargaining

Let π_j be a marginal value to the firm from hiring one type-$j \in \{h, l\}$ worker. The marginal value, denoted by J_j, must be equal to the discounted sum of the flow profit and the expected future profits, Letting Δt be a small time interval, the following must hold:

$$J_j = \frac{1}{1 + r\Delta t}[(G_N - w_j)\Delta t + (1 - s_j\Delta t)\cdot J_j + s_j\Delta t \cdot 0],$$

$$\to J_j = \frac{G_N - w_j}{r + s_j}. \tag{A7}$$

On the other hand, the marginal value to the firm from posting a vacancy for type-j worker is zero because all vacancy opportunities are exhausted by many atomistic firms.

The value to the type-j worker W_j and the value of an unemployed worker W_U are respectively

$$rW_j = w_j + s_j(W_U - W_j), \tag{A8}$$

$$rW_U = z + \sum_{j=h,l} \theta_j q_j (W_j - W_U), \tag{A9}$$

where z is an unemployment benefit. Once matched, the firm and the worker engage in the generalized Nash bargaining, resulting in the following sharing rule:

$$W_j - W_U : J_j - 0 = \beta : 1 - \beta,$$

$$\rightarrow W_j - W_U = \frac{\beta J_j}{1-\beta}, \tag{A10}$$

where $\beta \in (0,1)$ represents the worker's bargaining power and as noted earlier the value of the marginal vacancy is zero.

From (A5) and (A7) to (A10), we have

$$(r + s_j)(W_j - W_U) = w_j - rW_U, \qquad \because \text{(A8)}$$

$$\rightarrow (r + s_j) \cdot \frac{\beta}{1-\beta} \frac{G_N - w_j}{r + s_j} = w_j - rW_U, \qquad \because \text{(A7)\&(A10)}$$

$$\rightarrow \beta(G_N - w_j) = (1-\beta)(w_j - rW_U),$$

$$\rightarrow w_j = \beta G_N + (1-\beta) \cdot \left[z + \sum_{j=h,l} \theta_j q_j (W_j - W_U) \right] \qquad \because \text{(A9)}$$

$$\rightarrow w_j = \beta G_N + (1-\beta) \cdot \left[z + \sum_{j=h,l} \theta_j q_j \cdot \frac{\beta}{1-\beta} \frac{G_N - w_j}{r + s_j} \right] \qquad \because \text{(A7)\&(A10)}$$

$$\rightarrow w_j = \beta G_N + (1-\beta) z + \beta \sum_{j=h,l} \left[\theta_j q_j \cdot \frac{(r + s_j) c_j / q_j}{r + s_j} \right], \qquad \because \text{(A5)}$$

$$\rightarrow w_j = \beta G_N + (1-\beta) z + \beta \sum_{j=h,l} \theta_j c_j = w. \tag{A11}$$

The wage turns out to be common between the two types of workers. This result partly comes from the fact that both types of job have the same productivity.

4 Coexistence of the two types of jobs

4.1 Steady-state equilibrium

From (A5), we have

$$w_h = G_N - c_h(r + s_h)(\theta v_h)^{\eta}, \tag{A12}$$
$$w_l = G_N - c_l(r + s_l)\theta^{\eta}(1 - v_h)/(1 - v_h^{1-\eta}). \tag{A13}$$

We see that the wage of each type of job, w_j, decreases with the share of vacancy for the job, v_j, implying that these two equations can be thought of as the labor demand curves for each type of job.[3] The wage-setting curves are given by (A11):

$$w_h = \beta G_N + (1 - \beta)z + \beta\theta \sum_{j=h,l} v_j c_j, \tag{A14}$$
$$w_l = \beta G_N + (1 - \beta)z + \beta\theta \sum_{j=h,l} v_j c_j. \tag{A15}$$

Equations through (A12) to (A15) determine the steady-state values of (w_h, w_l, θ, v_h).

We use (A12) and (A14) to obtain

$$\begin{aligned}
&c_h(r + s_h)(\theta v_h)^{\eta} - c_l(r + s_l)\theta^{\eta}(1 - v_h)/(1 - v_h^{1-\eta}) = 0,\\
&\to c_h(r + s_h)v_h^{\eta}(1 - v_h^{1-\eta}) - c_l(r + s_l)(1 - v_h) = 0,\\
&\to c_h(r + s_h)v_h^{\eta} + [c_l(r + s_l) - c_h(r + s_h)]v_h - c_l(r + s_l) = 0,\\
&\to v_h^{\eta} + (\widetilde{c} - 1)v_h - \widetilde{c} = 0, \qquad \text{(A16)}\\
&\text{where } \ \widetilde{c} \equiv c_l(r + s_l)/c_h(r + s_h),
\end{aligned}$$

which determines v_h. We impose restrictions on parameters to ensure that both types of jobs coexist at the steady states. Let us define a function such that $H(\widetilde{v}_h) = \widetilde{v}_h^{\eta} + (\widetilde{c} - 1)\widetilde{v}_h - \widetilde{c}$. From the facts that $H(\widetilde{v}_h = 0) = -\widetilde{c} < 0$ and $H(\widetilde{v}_h = 1) = 0$, the condition for $H(\widetilde{v}_h) = 0$ to have a solution for $\widetilde{v} \in (0, 1)$ is that an infection point of $H(\widetilde{v}_h)$ must be in $[0, 1]$. The unique infection point is derived as

$$\begin{aligned}
0 = H'(\widetilde{v}_h) &= \eta\widetilde{v}_h^{\eta-1} + \widetilde{c} - 1,\\
\to v^{\#} &= \left(\frac{\eta}{1 - \widetilde{c}}\right)^{\frac{1}{1-\eta}}.
\end{aligned}$$

$v^{\#}$ is in $(0, 1)$ if $\eta + \widetilde{c} < 1$, in which case $G(\tilde{v}_h) = 0$ has a unique solution such that $v_h \in (0, v^{\#})$.

[3] It can be checked that $\partial w_h/\partial v_h = -\eta c_h(r + s_h)\theta^{\eta} v_h^{\eta-1} < 0$; $\partial w_l/\partial v_l = -\partial w_l/\partial v_h = -c_l(r + s_l)\theta^{\eta} v_h^{\eta}(1 - \eta - \widetilde{c})(1 - v_h)/(v_h - v_h^{\eta})^2$, noting that $v_h^{\eta} + (\widetilde{c} - 1)v_h - \widetilde{c} = 0$ and $1 - \eta - \widetilde{c} > 0$, as we will see shortly.

The condition will be assumed in the following analysis.

4.2 Stability

We will check that (a) v_h is a stable steady state and that (b) the corner solutions, $v_h \in \{0, 1\}$, are unstable. From (A1) and (A2), we have the laws of motion for q_h and q_l:

$$\dot{q}_h/q_h = (G_N - w_h)(\theta v_h)^{-\eta}/c_h - (r + s_h),$$
$$\dot{q}_l/q_l = (G_N - w_l)\theta^{-\eta}(1 - v_h^{1-\eta})/[c_l(1 - v_h)] - (r + s_l),$$

Noting that wages are exogenous to individual firms, $\dot{q}_j/q_j$ decreases with v_j. This ensures the stability of the steady state at which $\dot{q}_j/q_j = 0$ (or equivalently (A16)).

Next, we consider two endpoints. At $v_h \to 0$, we have

$$\lim_{v_h \to 0} \dot{q}_h/q_h = \infty > (G_N - w_l)\theta^{-\eta} - (r + s_l) = \dot{q}_l/q_l,$$

in which case the firm post more vacancies for high-skilled job so that $v_h \simeq 0$ is unstable. Similarly, we can check that $v_h \simeq 1$ is unstable. We thus conclude that v_h satisfying (A16) is the unique stable steady state.

5 Effect of FDI

We model FDI as a decrease in the separation rate: $\partial s_j/\partial FDI < 0$. We consider the effect of FDI in the short run where only jump variables, i.e., vacancies V_j, wages w_j, respond to changes in FDI. Given N_j, FDI decreases job destruction of both types of jobs:

$$\frac{\partial JD_j}{\partial FDI} = \frac{\partial s_j}{\partial FDI} N_j < 0,$$

which immediately implies that FDI also decreases aggregate job destruction:

$$\frac{\partial JD}{\partial FDI} = \sum_{j=h,l} \frac{\partial s_j}{\partial FDI} N_j < 0.$$

To see the effect of FDI on job creation, we need to know how FDI affects the share of high-skilled vacancy, v_h, and the vacancy-unemployment ratio, θ. Applying the implicit function theorem to (A16), we obtain

$$\begin{aligned}
v_h' &= \frac{\widetilde{c}'(1-v_h)}{\eta v_h^{\eta-1}+\widetilde{c}-1}, \\
&= \underbrace{\left(\frac{r+s_h}{r+s_l}-\frac{s_h'}{s_l'}\right)}_{\gtreqless 0}\underbrace{\frac{s_l'c_l(r+s_l)}{c_h(r+s_h)^2}\frac{1-v_h}{\eta\widetilde{c}/v_h-(1-\eta)(1-\widetilde{c})}}_{<0} \qquad \text{(A17)} \\
&= \begin{cases} <0 & \text{if } \; s_h'/s_l' < S^b \equiv (r+s_h)/(r+s_l) \\ \geq 0 & \text{if } \; s_h'/s_l' \geq S^b \end{cases}, \\
&\text{where } \; v_h' \equiv \frac{\partial v_h}{\partial FDI}, \quad s_j' \equiv \frac{\partial s_j}{\partial FDI} < 0, \quad \widetilde{c}' \equiv \frac{\partial \widetilde{c}}{\partial FDI} = \frac{s_l'c_l(r+s_l)}{c_h(r+s_h)^2}\left(\frac{r+s_h}{r+s_l}-\frac{s_h'}{s_l'}\right).
\end{aligned}$$

The sign of v_h' is determined by whether s_h'/s_l' is greater than $S^b \equiv (r+s_h)/(r+s_l)$.

From (A12) and (A14), we have

$$c_h(r+s_h)(\theta v_h)^\eta + \beta\theta[c_h v_h + c_l(1-v_h)] - (1-\beta)(G_N - z) = 0.$$

Differentiating both sides with respect to FDI gives

$$\begin{aligned}
&c_h s_h'(\theta v_h)^\eta + \eta c_h(r+s_h)(\theta v_h)^{\eta-1}(\theta v_h' + v_h\theta') + \beta\theta'[c_h v_h + c_l(1-v_h)] + \beta\theta v_h'(c_h - c_l) = 0, \\
&\text{where } \; \theta' \equiv \frac{\partial \theta}{\partial FDI}.
\end{aligned}$$

This is simplified to

$$\begin{aligned}
\theta' &= -\frac{[\eta v_h'/v_h + s_h'/(r+s_h)][(1-\beta)(G_N-z)-\beta\theta g] + \beta\theta v_h'(c_h-c_l)}{(1-\beta)(G_N-z)\eta/\theta + \beta f(1-\eta)}, \\
&= \frac{\Theta_1 s_h' - \Theta_2 s_l'}{c_h(r+s_h)^2[(1-\beta)(G_N-z)\eta/\theta+\beta f(1-\eta)][\eta\widetilde{c}-v_h(1-\eta)(1-\widetilde{c})]}, \qquad \text{(A18)} \\
&= \begin{cases} >0 & \text{if } \; s_h'/s_l' < S^d \equiv \Theta_2/\Theta_1 \\ \leq 0 & \text{if } \; s_h'/s_l' \geq S^d \end{cases}, \\
&\text{where } \; f \equiv \sum_{j=h,l} v_j c_j, \quad x \equiv (1-\beta)(G_N-z) - \beta\theta f > 0, \\
&\qquad \Theta_1 \equiv v_h c_h (r+s_h)[\beta\theta(1-v_h)\widetilde{c}(c_h-c_l) + x(1-\eta-\widetilde{c})] > 0, \\
&\qquad \Theta_2 \equiv c_l(r+s_h)(1-v_h)[\eta x + \beta\theta v_h(c_h-c_l)] > 0,
\end{aligned}$$

and where we used the following relation:

$$c_h(r+s_h)(\theta v_h)^\eta = (1-\beta)(G_N-z) - \beta\theta f > 0. \qquad \because \text{(A12)\&(A14)}$$

Job creation, defined as $JC = \theta q(\theta)U = \theta^{1-\eta}U$, is an increasing function of θ given U and thus decreases (or increases) with FDI if $s_h'/s_l' < S^d$ (or $s_h'/s_l' > S^d$).

With these in hand, we can see the effect of FDI on job creation of the two types of jobs. It can be checked that $JC_h = (\theta v_h)^{1-\eta}U$ always increases with FDI:

$$\begin{aligned}
&\frac{\partial JC_h}{\partial FDI} = \frac{\partial[(1-\eta)(\theta v_h)^{-\eta}(v_h\theta' + \theta v_h')U]}{\partial FDI}, \\
&\to \text{sign}\left\{\frac{\partial JC_h}{\partial FDI}\right\} = \text{sign}\{\theta'/\theta + v_h'/v_h\}, \\
&\qquad\qquad\qquad\qquad = \text{sign}\left\{(\Gamma_2 s_l' - \Gamma_1 s_h')/\underbrace{[c_h(r+s_h)^2(\eta x + \beta\theta f)\{\eta\widetilde{c} - v_h(1-\eta)(1-\widetilde{c})\}]}_{>0}\right\} \\
&\qquad\qquad\qquad\qquad = \text{sign}\left\{\Gamma_2 s_l' - \Gamma_1 s_h'\right\}\begin{cases} > 0 & \text{if } s_h'/s_l' > S^a \equiv \Gamma_2/\Gamma_1 \\ \leq 0 & \text{if } s_h'/s_l' \leq S^a \end{cases},
\end{aligned}$$

$$\begin{aligned}
\text{where }\; &\Gamma_1 \equiv c_h(r+s_h)[x\{\eta\widetilde{c} - v_h(1-\eta)(1-\widetilde{c})\} + \beta\theta c_l\widetilde{c}(1-v_h)] > 0, \\
&\Gamma_2 \equiv \beta\theta c_l^2(r+s_h)(1-v_h), \\
&S^b - S^a = \frac{r+s_h}{r+s_l} - \frac{\Gamma_2}{\Gamma_1} = \frac{xc_h(r+s_h)^2[\eta\widetilde{c} - v_h(1-\eta)(1-\widetilde{c})]}{\Gamma_1(r+s_l)} > 0.
\end{aligned}$$

JC_h increases (or decreases) with FDI if $s_h'/s_l' > S^a$ (or $s_h'/s_l' < S^a$).

On the other hand, $JC_l = JC - JC_h = \theta^{1-\eta}(1 - v_h^{1-\eta})U$ may increase or decrease with FDI depending on s_h'/s_l':

$$\begin{aligned}
&\frac{\partial JC_l}{\partial FDI} = \frac{\partial[(1-\eta)\theta^{-\eta}\{(1-v_h^{1-\eta})\theta' - \theta v_h^{-\eta}v_h'\}U]}{\partial FDI}, \\
&\to \text{sign}\left\{\frac{\partial JC_l}{\partial FDI}\right\} = \text{sign}\{\widetilde{c}(1-v_h)\theta' - \theta v_h'\} \\
&\qquad\qquad = \text{sign}\left\{(\Omega_1 s_h' - \Omega_2 s_l')/\underbrace{[\{c_l(1-v_h)\}^{-1}\cdot v_h c_h^2(r+s_h)^3(\eta x + \beta\theta f)\{\eta\widetilde{c} - v_h(1-\eta)(1-\widetilde{c})\}]}_{>0}\right\} \\
&\qquad\qquad = \text{sign}\left\{\Omega_1 s_1' - \Omega_2 s_2'\right\}\begin{cases} > 0 & \text{if } s_h'/s_l' < S^c \equiv \Omega_2/\Omega_1 \\ \leq 0 & \text{if } s_h'/s_l' \geq S^c \end{cases},
\end{aligned}$$

$$\begin{aligned}
\text{where }\; &\Omega_1 \equiv v_h c_h(r+s_h)(r+s_l)\left[(1-\widetilde{c})\{x + \beta\theta v_h(c_h - c_l)\} + \beta\theta c_l\left(1 + \frac{r+s_l}{r+s_h} - \widetilde{c}\right)\right] > 0, \\
&\Omega_2 \equiv c_h(r+s_h)^2\left[\beta\theta(c_h - c_l)(1-\widetilde{c})v_h^2 + \left\{\eta x(1-\widetilde{c}) + \beta\theta c_l\left(1 + \frac{r+s_l}{r+s_h} - \widetilde{c}\right)\right\}v_h + \eta x\widetilde{c}\right] > 0, \\
&S^d - S^c = \frac{\Theta_2}{\Theta_1} - \frac{\Omega_2}{\Omega_1} = \frac{xv_h c_h^2(r+s_h)^3(\eta x + \beta\theta f)[\eta\widetilde{c} - v_h(1-\eta)(1-\widetilde{c})]}{\Theta_1\Omega_1} > 0.
\end{aligned}$$

We summarize the results in the following proposition.

Proposition. *Assume that (i) an exogenous increase in FDI decreases the job-separation rate* s_j*; (ii) the relative cost of high-skilled vacancy is sufficiently high, i.e.,* $\eta + \widetilde{c} < 1$ *or* $c_h/c_l > (r+s_l)/[(1-\eta)(r+s_h)]$*; and (iii) the marginal product of labor is sufficiently high, i.e.,* $x > 0$ *or* $G_N > z + \beta \sum_j v_j c_j/(1-\beta)$*. Depending on the magnitude of the effect of FDI on* s_h *relative to that on* s_l*, i.e.,* s_h'/s_l*, we obtain the following comparative-statics results.*

$\frac{s_h'}{s_l'} \equiv \frac{\partial s_h}{\partial FDI} \Big/ \frac{\partial s_l}{\partial FDI}$	$\frac{\partial JC}{\partial FDI}$	$\frac{\partial JC_h}{\partial FDI}$	$\frac{\partial JC_l}{\partial FDI}$	$\frac{\partial v_h}{\partial FDI}$	Case
$[0, S^a)$	$+$	$-$	$+$	$-$	(i)
$[S^a, S^b)$	$+$	$+$	$+$	$-$	(ii)
$[S^b, S^c)$	$+$	$+$	$+$	$+$	(iii)
$[S^c, S^d)$	$+$	$+$	$-$	$+$	(iv)
$[S^d, \infty)$	$-$	$+$	$-$	$+$	(v)

We note that the effects of FDI on aggregate job destruction, high-skilled job destruction, and low-skilled job destruction are always negative.

We suppose that FDI to Asia decreases s_l much significantly than s_h, corresponding to case (i). Then it leads to an expansion of total job creation and low-skilled job creation, and an contraction of high-skilled job creation. On the other hand, we suppose that FDI to Europe or North America has an exactly opposite effect of job separations rates, corresponding to case (v). It results in an opposite effect on total job creation, and high/low-skilled job creations.

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